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A new trematode from a beaver.

E. W. PRICE.

During the year 1932, Dr. Ronald G. Law, Experimental Fur Farm, Kirkfield, Ontario, forwarded to the writer 3 specimens of a peculiar trematode which had been collected from the small intestine of a beaver. This fluke has many of the characters of the echinostomes and is tentatively assigned to the family Echinostomatidae but cannot be allocated to any of the existing genera. For this fluke the name *Stephanoproraoides lawi*, n. g., n. sp. is proposed.

Stephanoproraoides, n. g.

Generic diagnosis.—Echinostomatidae: Body elongated, subcylindrical. Oral sucker well developed, not surrounded by an adoral disc or spines; acetabulum situated at tip of a long pedicle. Other characters as in *Stephanoprora*.

Type species.—*Stephanoproraoides lawi*, n. sp.

Stephanoproraoides lawi, n. sp.

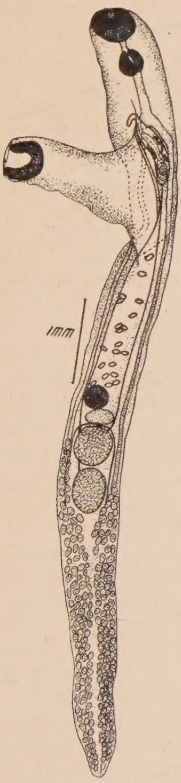

FIG. 1. *Stephanoproraoides lawi*, n. sp.

Description.—Body elongated (fig. 1), subcylindrical, 9 to 9.5 mm. long by 629 to 680μ wide. Cuticula missing on all available specimens. Oral sucker well developed, subterminal, 510μ in diameter; not provided with an adoral disc or spines; acetabulum well developed, 425 to 476μ in diameter, situated on a pedicle about 2.3 mm. long; base of pedicle 1.53 to 1.7 mm. from anterior end of body. Prepharynx 136 to 260μ long; pharynx 225 to 255μ in diameter; esophagus about 500μ long; intestinal ceca simple, extending to posterior end of body. Excretory pore terminal; excretory vesicle tubular and provided with a few lateral branches, extending to level of caudal pole of posterior testis. Genital aperture median, 1.1 to 1.19 mm. from anterior end of body. Cirrus pouch slender, 935μ to 1 mm. long by 160 to 200μ wide near its posterior end, containing a long, slender cirrus, an oval pars prostatica, and an undivided seminal vesicle nearly filling posterior, widened portion of cirrus pouch. Testes postequatorial and tandem; anterior testis globular, 460 to 510μ in diameter; posterior testis oval, 510μ long by 425μ wide. Ovary globular, 255μ in diameter, pretesticular, slightly to right of median line. Mehlis' gland strongly developed, between ovary and anterior testis. Seminal receptacle absent; receptaculum seminis uterinum present. Laurer's canal long and slender, opening in mid-dorsal line a short distance anterior to level of anterior margin of ovary. Vitellaria consisting of large follicles almost filling posttesticular area and extending from level of middle of posterior testis to posterior end of body (in one specimen right vitellarium extends anteriorly as far as anterior testis). Uterus long and somewhat convoluted. Eggs oval, 100 to 108μ long by 68 to 72μ wide.

Host.—*Castor canadensis.*

Location.—Small intestine.

Type locality.—Kirkfield, Ontario.

Type specimens.—U. S. N. M. Helm. Col. No. 32572; paratypes No. 32573.

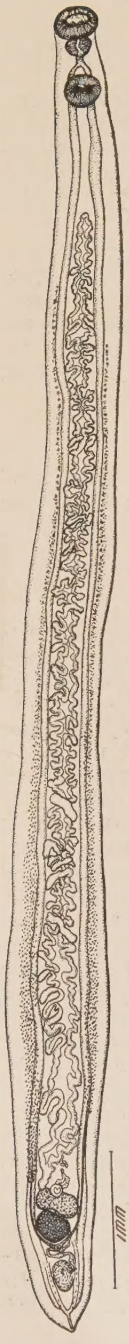

Fig. 2. *Scaphiostomum pancreaticum*, n. sp., ventral aspect.

This trematode resembles species of the genus *Stephanoprora* Odhner in general body form and arrangement of the reproductive organs. It differs from members of that genus in the peculiar stalked acetabulum and in the absence of an adoral disc. So far as the writer is aware, the only trematodes in which the acetabulum is situated on a pedicle, such as in the present species, are members of the Accacoeliidae Looss, all of which are parasites of fishes. Aside from the fact that the members of the Accacoeliidae are parasites of fishes, the arrangement of the various organs precludes the possibility of relationship between the accacoeliids and the species described in this paper.

Two new species of trematodes, *Scaphiostomum pancreaticum* n. sp. and *Postharmostomum laruei* n. sp., from the chipmunk. Allen McIntosh.

Scaphiostomum pancreaticum, n. sp.

In the summer of 1928, while at the Michigan Biological Station at Douglas Lake, the writer examined 5 chipmunks, *Tamias striatus lysteri* (Richardson), for parasites. From the pancreatic duct of one animal, 4 specimens of a slender, delicate fluke were collected. This is a new species, apparently belonging to the genus *Scaphiostomum* Braun, 1901.

Description.—Body ribbon-like (fig. 2), 9.71 mm. long by approximately 500μ to 700μ wide (paratype specimen somewhat contracted, 12.75 mm. long by 900μ wide); aspinose. Oral sucker well developed, 235μ long by 300μ wide, width equal to that of terminal portion of body; mouth opening transverse oval. Pharynx well developed, 100μ long by 160μ wide. Esophagus short. Intestinal crura extending caudad and terminating near posterior end of body; branches of crura fairly uniform in width, average diameter about 50μ. Acetabulum 240μ long by 255μ wide, immediately posterior to pharynx. Excretory pore terminal; a short tube leading from pore, dividing into 2 primary tubes, extending between branches of crura to near acetabulum, crossing crura ventrally and continuing lateral to crura as far as zone of pharynx, then bending sharply backwards and descending lateral to crura as far as tips of ceca, and then dividing into secondary branches. Reproductive organs median, tandem, at posterior end of body; anterior testis almost rectangular, 160μ long by 270μ wide, its anterior border about 1 mm. from posterior tip of body; posterior testis oval, 240μ long by 150μ wide, about 290μ from posterior tip of body. Seminal vesicle coiled in front of genital pore; cirrus short, sometimes projecting through genital pore. Genital pore conspicuous, median, at level of anterior margin of anterior testis; numerous radiating lines present about sphincter of pore giving the pore a sucker-like appearance. Ovary 185μ long, subspherical, between testes, nearer to anterior testis than to posterior testis. Oviduct arising from posterior part of ovary; ootype, Mehlis' gland and vitelline reservoir immediately posterior to ovary; fecundarium antero-lateral to posterior testis; Laurer's canal lateral and dorsal to posterior testis. Vitellaria extracecal, extending from level of genital pore to near level of turning point of uterus; in some specimens anterior half of vitellaria less conspicuous than posterior half. Vitelline ducts uniting directly posterior to ovary. Metraterm well developed, entering genital pore from left side. Uterus filled with eggs, intercecal, extending anteriorly almost to acetabulum, the distance from acetabulum being about twice body width at turning point of uterus. Eggs brownish yellow, 35μ long by 18μ wide.

Type specimen.—U. S. N. M. Helm. Coll. No. 34307; paratype, Harvard Mus. Comp. Zool., Sandground Coll. No. 40Ta.

Habitat.—Pancreatic duct of *Tamias striatus lysteri*, Douglas Lake, Mich.

Remarks.—This species may be separated from *Scaphiostomum illatabile* Braun, 1901, the genotype and only other species of the genus, by the relative distance of the reproductive organs from the posterior end. In *S. illatabile* the reproductive organs are removed the width of their zone or more from the posterior end, and the genital pore is slightly anterior to anterior testis, while in *S. pancreaticum* the reproductive organs are removed about half the width of their zone from the posterior end, and the genital pore is at the level of the anterior margin of the anterior testis.

Postharmostomum laruei, n. sp.

Of the 5 chipmunks mentioned earlier, 2 contained, in the cecum, 6 specimens each of a new fluke belonging to the genus *Postharmostomum* Witenberg, 1923. A few immature specimens were taken from the stomach and intestine of one of the chipmunks; these resembled immature forms found in land snails about the Biological Station. Some of the young forms from snails were fed to white rats and, on post-mortem examination, flukes, which corresponded to those found in the cecum of the chipmunk, were recovered from the rats. The flukes are described here as a new species, and named in honor of Dr. George R. LaRue, Director of the University of Michigan Biological Station.

Description.—Body oblong (fig. 3), 2.8 mm. long by 1.4 mm. wide, flat ventrally and convex dorsally, broadly rounded anteriorly and slightly tapering posteriorly; aspinose. Anterior sucker subterminal, 410μ long by 500μ wide; mouth opening circular. Pharynx almost spherical, 250μ in diameter. Intestinal crura in regular waves, 6 medial crests in each branch; medial crest of waves extending almost to median line, 2 pairs preacetabular, 2 pairs immediately postacetabular, and 2 pairs in zone of reproductive organs. Acetabulum equatorial, 420μ long by 450μ wide. Excretory pore median and dorsal, near posterior tip of body; a short tube leading from the pore, extending between tips of intestinal crura, and dividing into 2 primary tubes near posterior margin of posterior testis, crossing crura ventrally and extending along each side of body near outermost crests of crura as far as zone of oral sucker, then bending sharply backwards and descending, dorsal to ascending portion, to near tips of crura; course of tubes from this point not visible in whole mounts. Reproductive organs (ovary and testes) approximately equal in size, irregular in outline, arranged in a triangle, in posterior fourth of body; anterior testis longer than wide, 290μ by 200μ, to left of median line, its anterior margin about ¼ body length from posterior end; posterior testis wider than long, 185μ by 290μ, near median line, less than twice its length from posterior tip of body; zone of posterior testis usually separate from zone of anterior testis; field of posterior testis contiguous with, or slightly overlapping, portion of field of anterior testis. Seminal vesicle coiled, in front of genital pore. Genital pore median, at level of anterior margin of

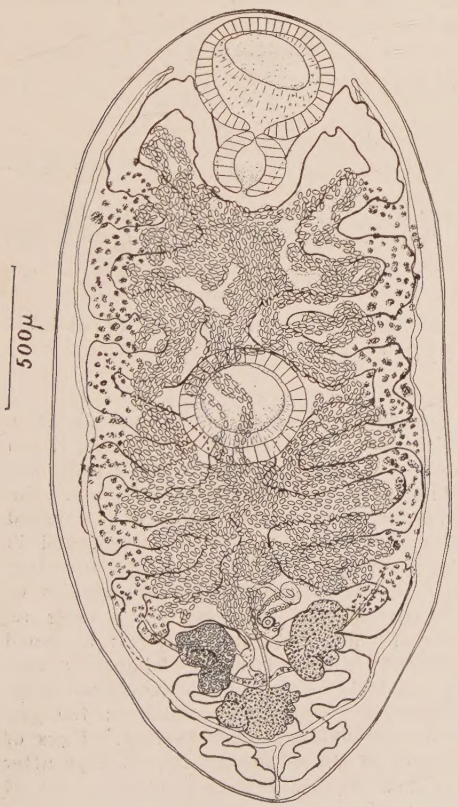

FIG. 3.

Postharmostomum laruei, n. sp., ventral aspect.

ovary. Ovary longer than wide, 250μ by 197μ, to left of median line, its zone in some specimens coinciding with zone of anterior testis, but usually overlapping a portion of zone of posterior testis; fields of ovary and posterior testis partially overlapping. Oviduct arising from mesal side of ovary; ootype, Mehlis' gland and vitelline reservoir mesal of ovary and anterior of posterior testis; fecundarium and Laurer's canal not observed. Vitellaria arranged along each side of body in fields of, and ventral to, outer crests of intestinal crura, extending anteriorly as far as level of posterior margin of pharynx and posteriorly as far as level of anterior margins of ovary and anterior testis. Vitelline ducts uniting immediately in front of posterior testis, forming common vitelline duct. Uterus consisting of numerous coils filled with eggs; coils extending anteriorly into area lateral to pharynx. Eggs light brown, 29μ by 18μ.

Type specimen.—U. S. N. M. Helm. Coll. No. 34308.

Habitat.—Cecum of *Tamias striatus lysteri*, Douglas Lake, Michigan.

Remarks.—Since the sinuosity of the ceca is one of the most important characters of the genus *Postharmostomum* Witenberg, 1923, which was later regarded as a subgenus of *Harmostomum* by Witenberg (1925), the writer, for the present at least, prefers to regard *Postharmostomum* as of generic rank, especially since another species is now known with the same outstanding diagnostic character as that of the genotype, *Postharmostomum gallinum* Witenberg, 1923. An additional species, *Harmostomum commutatum* (Dies., 1858) was placed in *Postharmostomum* by Witenberg, but a restudy may prove *H. commutatum* not to be congeneric with the other two species. *P. laruei* shows some similarity to Leidy's figure 2 of *Distoma vagans* Leidy (1850, J. Acad. Nat. Sc., 2. s., 1: pl. 43) which was obtained from land snails. However, it appears that the description and illustrations as given by Leidy represent more than one species, and for this reason the writer believes a new name is justified for the species described here.

The following key will aid in separating the species:

1.	Acetabulum approximately equatorial; vitellaria ending near zone of pharynx; in mammals	*P. laruei*, n. sp.
	Acetabulum preequatorial; in birds	2
2.	Vitellaria ending anteriorly in or near acetabular zone	*P. gallinum*
	Vitellaria ending in or near zone of pharynx	*P. commutatum*

A note on some intermediate hosts of *Echinostoma revolutum* (Froelich).

A. M. Fallis (Communicated by S. Hadwen).

The writer has found rediae and cercariae of *Echinostoma revolutum* in *Stagnicola palustris* (Say), *Helisoma trivolvis* (Say) and *Physa gyrina* (Say). In most of the snails the infection was extremely heavy, and some snails contained sporocysts of fork-tail cercariae in addition to the echinostome infection. Encysted agamodistomes of *E. revolutum* were also found in the above named snails, as well as in *Fossaria modicella* (Say) and *F. abrussa* (Say), and in pelecypods (*Sphaerium* sp.). Tadpoles were also found to serve as secondary intermediate hosts for *E. revolutum*. In order to determine the species of echinostome involved, 2 goslings were fed infected tadpoles; one gosling received tadpoles which had become infected under natural conditions; a second gosling was fed tadpoles which had been infected under laboratory conditions; and a third was held as a control. Eggs of *E. revolutum* were recovered from the feces of the first gosling 19 days after feeding; the gosling was killed and 3 flukes were recovered 36 days after feeding. Eggs of *E. revolutum* were obtained from the feces of the second gosling 15 days after feeding; this gosling died 24 days after being fed infected tadpoles, and 34

echinostomes were recovered. The control bird was negative for trematode infection at the termination of the experiment.

Note on *Microphallus obstipus* and *M. medius* Van Cleave and Mueller. JUSTUS F. MUELLER.

A restudy of additional specimens of *Microphallus obstipus* and *M. medius* reveals that these worms possess a true cirrus sac, lying transversely anterior to the acetabulum. This structure, in the original notice, was misinterpreted and designated as an "elongated seminal vesicle." The possession of a cirrus sac excludes these forms from *Microphallus* in which this structure is lacking, but they conform to the plan of structure of the related genus *Maritrema*. Hence these species are correctly designated as *Maritrema obstipum* and *M. medium*.

Notes on the life history of *Panopistus pricei* Sinitsin, 1931. WENDELL H. KRULL.

The snail, *Zonitoides arboreus* (Say), has been determined to be a first and second intermediate host of *Panopistus pricei*. Eggs obtained from a single specimen of *P. pricei*, collected from a shrew, *Blarina brevicauda*, were fed, using rolled oats as a conveyor, to snails, *Zonitoides arboreus*. The cercariae appeared on the surfaces of all snails which became infected, in not longer than 44 days after they were exposed to infection. Uninfected snails became infected when exposed to one of these first intermediate host snails having an active infection; i. e., one with cercariae on the surface of the body. One of these snails, examined 21 days after the beginning of the exposure to the first intermediate snail host, contained 40 larvae, 10 of which were metacercariae and the rest cercariae in various stages of growth. This establishes the snail as a second intermediate host.

The snails used in the experiment were raised in the laboratory and the eggs from which they hatched were laid by snails kept under controlled conditions, thus precluding the possibility of any extraneous infections in the snails used in the experiment. All snails were kept in terraria, the contents of which had been sterilized to prevent contamination.

Details of the life history will be published elsewhere.

Egg albumen as a mounting medium in the study of living helminths. WENDELL H. KRULL.

Fresh egg albumen has been found to be a very satisfactory medium in which to study living larval helminths and since this use of albumen, with its possible applications, has not been published, insofar as the writer is aware, the following notes are recorded. The albumen may be kept in the laboratory at room temperature for several days in a covered watch glass, and becomes more serviceable after the first day for the reason that the consistency becomes more uniform. The medium is useful in research and should be very helpful in class work where slides of delicate larvae, such as miracidia, are studied. Such slides may be prepared before the opening of the laboratory period and remain serviceable for the entire laboratory period.

In making the mounts, concentrate the larvae in as small an amount of water as possible in a suitable container, such as a Bureau of Plant Industry model watch glass. Transfer a small amount of the albumen to the container with a toothpick or wood sliver and stir the larvae into the mass. The mass may then be transferred to a slide with the toothpick. If the mass is to be divided into 2 or more parts it may be cut with fine scissors. Cover the mass on the slide with a large cover glass and, if necessary, force it down with a

teasing needle until all space between the slide and cover is filled with the albumen. The slide becomes semipermanent when the albumen has dried around the edge of the cover. The larvae, depending on the kind, will remain alive from an hour to several days without disintegrating. Some slides are of value for some features after the death of the larva.

The medium is excellent for using *intra-vitam* stains. When using such a stain, transfer the albumen to a small watch glass and add to it enough of a concentrated aqueous solution of the stain to tint the albumen, then follow directions as previously given. The stain is absorbed slowly by the larva and an unusual amount of differentiation may result as compared with that obtained by the usual methods. With this method it is possible to stain readily some larvae which, with other methods, stain with difficulty.

Some of the advantages of this method are as follows: (1) Immersion oil on the lens does not move the cover glass or disturb the larva when the position of the slide is changed, (2) larvae are relatively stationary, and (3) larvae may be observed for long periods of time before ante-mortem changes take place.

Other advantages are as follows: Miracidia of *Fasciola* remain in an extended condition but the cilia are usually inactive although normal in every other respect; the natural curvatures in the individual cilium on certain parts of the body are retained. Individual miracidia remain in excellent condition for study for as long as 2 hours, the flame cells remaining active. In some cases during or after this period of time some of the epidermal plates were shed with their cilia intact.

Cercariae from land snails normally contract when studied in a sufficient amount of water or in 0.2, 0.4, 0.7 and in 0.9 percent saline solution or quickly undergo ante-mortem changes when under pressure; such cercariae, either stained or unstained, have been studied for hours in the albumen. When in albumen, cercariae of *Fasciola* have been observed to secrete the cystogenous material for the outside cyst; this secretion remained in an unchanged condition so that these structures could be studied. After most of the material had been secreted, the cercariae could be taken off the slide and the albumen carrying the cyst material could be washed off. After the cercariae were remounted, the secretion forming the inner cyst was secreted, and these structures, which remained intact, could then be studied. On many slides containing either stained or unstained cercariae, the larvae, at some time, would escape from the cyst material and be a perfect specimen for study without washing and remounting. Some cercariae never secrete the cystogenous material, but are, nevertheless, excellent specimens for studying internal anatomy. Cercariae remain in good condition, without change, for more than 3 hours and have been observed to be alive, stained and in good condition, for as long as 18 hours.

Very active larval parasitic nematodes, as well as soil nematodes, mounted in the albumen medium became quite inactive in 3 hours and showed no ante-mortem changes 24 hours later when stained or unstained.

The discharge of eggs from segments of *Thysanosoma actinioides*. M. C. Hall.

In 1912, the writer noted, while investigating the life history of *Thysanosoma actinioides*, that the terminal segments of this worm never show shelled eggs, that detached segments in the cecum and colon always showed shelled eggs, that segments in freshly passed manure usually, but not always, have eggs in them, and that segments in manure which has been passed for some time seldom have eggs in them. When a fresh proglottid was placed in a dry bottle, left there for a time, and then examined, the segments would be found devoid of eggs and there would be a ring of eggs at some distance around the segment, the eggs apparently being ejected from the segment as it dried. This is a very unusual procedure in tapeworms. Apparently the eggs are discharged by dehiscence as the segments dry, or may be discharged by pressure in passing

the anal sphinter. The significance of this distribution of eggs by discharge from the segment may be more evident when the life history of this worm is known. At the moment it looks like evidence that a coprophagous insect is not an intermediate host, since it would seem to be of little advantage to scatter the eggs from a segment lying on the surface of manure when most of them would then land on vegetation or soil away from the manure.

The occurrence of *Taenia ovis* in dogs at Washington, D. C. W. H. WRIGHT and J. BOZICEVICH.

Among dogs secured from the Washington, D. C., dog pound during the past two years, two animals were found, on necropsy, to harbor, respectively, 1 specimen and 4 specimens of *Taenia ovis*. This record and that of cysticercosis in lambs at Beltsville, Md. (1933, J. Parasitol. 19:251), would seem to indicate an eastern distribution of this parasite which, heretofore, has been thought to be confined to the Rocky Mountain and Pacific Coast States.

Two mutually limiting parasites of ciscoes. S. X. CROSS.

From a single catch of ciscoes taken from Silver Lake by the Wisconsin Geological and Natural History Survey, 92 specimens were examined for parasites. This group harbored large numbers of acanthocephalids (genus *Neoechinorhynchus*) and adult cestodes (*Proteocephalus exiguus*) with few other parasites of any kind. An examination of the numbers of these two parasites shows them to be mutually limiting when found in large numbers in one host. Thus fish that harbored 25 or more mature tapeworms had regularly very few acanthocephalids or none at all. In the same way fish harboring 20 or more acanthocephalids had very few tapeworms. In no case was one individual heavily parasitized with both parasites although light infections were often quite equally divided. Such a relationship is suggested in data obtained for other species of fish but the number of heavily infected specimens is so small that the figures are merely indicative.

The use of hexylresorcinol in the treatment of tapeworm infestation. O. R. MCCOY.

In view of the efficacy of crystalline hexylresorcinol as an anthelmintic for ascaris and hookworm, a trial was made of this drug in the treatment of human tapeworm infestations. Eight persons harboring *Taenia saginata* and one infested with *Diphyllobothrium latum* have so far been treated and followed up. In 6 of the 8 cases of *T. saginata* the worm regenerated in from 2 to 3 months after treatment. The other 2 cases were apparently cured. One child was treated on 3 separate occasions without success. Following administration of the drug to the person harboring *D. latum*, eggs could not be found in the feces for a period of about 6 weeks, but subsequently they reappeared in large numbers. Details of the treatments are shown in the following table.

TAENIA SAGINATA

Case No.	Age	Dose	No. of doses	Interval between doses	Result
1	27	1.0 gm.	1	....	Segments recurred in 3 months
2	23	1.0 gm.	1	...	Had not recurred in 8 months
3	39	1.0 gm.	1	....	Segments recurred in 3 months
4	22	1.0 gm.	1	....	Segments recurred in 1½ months
5	23	1.0 gm.	2	1 day	Segments recurred in 2 months
6	39	1.0 gm.	2	1 day	Had not recurred in 3½ months
7	43	1.0 gm.	2	2 days	Segments recurred in 2 months
8	5	0.4 gm.	2	1 week	Segments recurred in 3 months
		0.6 gm.	2	2 days	Segments recurred in 2 months
		0.8 gm.	1	....	Segments recurred in 5 months
DIPHYLLOBOTHRIUM LATUM					
1	27	1.0 gm.	2	1 week	Eggs reappeared in 2 months

Daubaylia potomaca, n. sp., a nematode parasite of snails, with a note on other nemas associated with molluscs.

B. G. CHITWOOD and M. B. CHITWOOD.

Several species of nemas have been reported from snails at various times but up to the present no comprehensive study of their nemic fauna has been made. The writers have examined several hundred snails of various groups and have found numerous species of nemas associated with them, among which was a form belonging to a new genus and species apparently related to the cephalobids. The name *Daubaylia* is proposed for this genus, which is considered the type of a new subfamily, DAUBAYLIINAE, differing from the Cephalobinae in that the valves of the posterior part of the esophagus are completely degenerated and the stoma is greatly reduced. A new family, CEPHALOBIDAE, is proposed for the two subfamilies mentioned above, this family being characterized by the distinct joints of the stomatorhabdions, the absence of a distinct swelling at the base of the corpus, the presence of but one ovary in the female, and a special distribution of the genital papillae in the male.

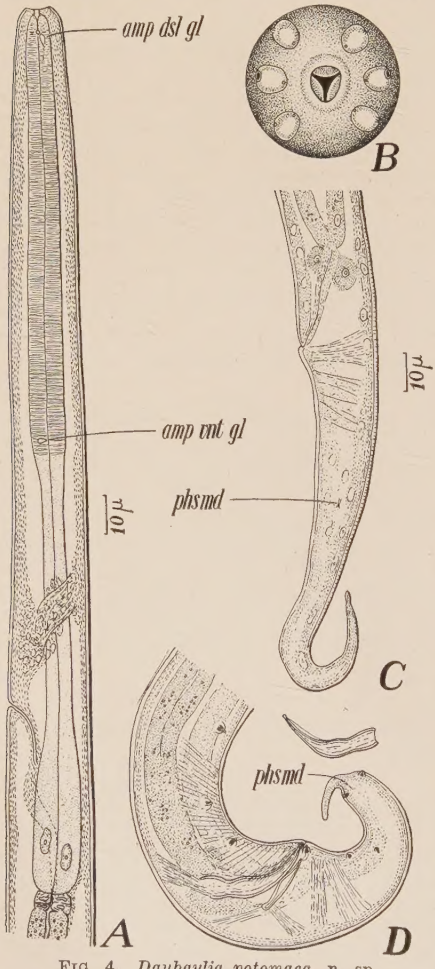

FIG. 4. *Daubaylia potomaca*, n. sp. A—Esophageal region. B—Head, *en face* view. C—Female tail. D—Male tail and spicule. amp dsl gl, ampulla of dorsal esophageal gland; amp vnt gl, ampulla of subventral esophageal glands; phsmd, phasmids.

Daubaylia, n. g.

Generic diagnosis. — Daubayliinae: Lips 6, discrete; cephalic papillae 10 (complete internal circle and 4 of external circle—laterodorsals and lateroventrals), on lips; amphids dorsolateral, on lips. Stoma reduced, surrounded by fibrous tissue, only cheilorhabdions well developed. Esophagus with subcylindrical corpus, long isthmus, anguillulinoid pseudobulb.

Type species.—Daubaylia potomaca, n. sp.

Daubaylia potomaca, n. sp.

Description. — Daubaylia: Male 1.52 to 1.82 mm. long by 24 to 30μ wide. Corpus of esophagus 98 to 100μ long by 6.3 to 7.5μ wide; isthmus 52 to 62μ long by 3.5 to 4.4μ wide; pseudobulb 37 to 50μ long by 14 to 15μ wide. Nerve ring 116 to 125μ, excretory pore 160 to 175μ from anterior extremity. Cloacal aperture 52 to 56μ from posterior extremity. Testis single, extending anteriad to within 640 to 660μ from anterior extremity, then reflexed 2 to 3 body diameters. Genital papillae as in figure 4 D; phasmids lateral, subterminal. Spicules 28 to 29μ long; gubernaculum 16μ long.

Female 1.74 to 1.84 mm. long by 30 to 40μ wide. Corpus of esophagus 106 to 109μ long by 8 to 10μ wide; isthmus 70 to 80μ long; pseudobulb as in male. Nerve ring 125 to 180μ, excretory pore 150 to 172μ, from an-

terior extremity. Anus 100 to 106μ from posterior extremity; tail conically attenuated, tip recurved dorsad; phasmids 1/3 length of tail posterior to anus. Vulva 1.0 to 1.06 mm. from anterior extremity; monodelphic, prodelphic, ovary reflexed posteriad; gonad extending to within 650 to 740μ of anterior extremity, ovary extending 340 to 450μ posterior to vulva, then reflexed anteriad about 30μ to blind end.

Host.—*Planorbis* (*Helisoma*) *trivolvis.*

Location.—Pulmonary cavity.

Locality.—Virginia (Jones Point, Potomac River).

Type specimens.—U. S. N. M. Helm. Coll. No. 33744.

Baylis and Daubney (1922) described a species, *Cephalobus seistanensis*, from *Gyraulus convexiusculus* collected in Persia, which appears to be congeneric with *Daubaylia potomaca*, the name of that species becoming *Daubaylia seistanesis* (Baylis and Daubney, 1922) n. comb. *D. seistanensis* differs from *D. potomaca* in that the body of the former is 4.75 to 5.3 times as long as the esophagus while in the latter it is 7 to 8.5 times as long as the esophagus.

In addition to *D. potomaca*, the writers have found the following species of nematodes in snails: *Rhabditis monhystera* (larvae) from *Opeas goodalli* (eggs and liver) and *Polygyra albolabrus* (intestine); *R. causanelli* (larvae) from *Opeas goodalli* (muscles); *Rhabditis* sp. (encysted larvae) from *Helix hortensis*, *Polygyra thyroides* and *Helix aspersa; Cephalobus persegnis* (adults) from *Helix hortensis* (liver and intestine); *Cephalobus bütschlii* (adults) from *Polygyra albolabrus; Dorylaimus stagnalis* (1 dead) from *Polygyra tridentata juxtidens* (intestine); *Actinolaimus* sp. (1 dead) from *Helisoma trivolvis* (intestine); *Aphelenchus avenae* (adults) from *Polygyra albolabrus* (intestine); *Aphelenchoides parietinus* from *Philomycus dorsalis* (intestine); *Cosmocercoides variabilis* (adults) from *Limax agrestis* (intestine) and *Opeas goodalli* (intestine); *metastrongylids* (encysted larvae) from *Helix lactea* and *Helix aspersa* (muscles); and *Daubaylia* sp. (larvae) from *Philomycus carolinensis* (muscles).

Somatic musculature in nematodes. B. G. Chitwood and M. B. Chitwood.

The character of the somatic musculature is known for numerous parasitic nematodes but for only comparatively few free-living forms. The transition from meromyarian to polymyarian musculature, with coincident, gradual transition from platymyarian to coelomyarian musculature, has been established in representatives of several different groups. Martini (1906, Zeit. wiss. Zool. 81: 699-766) showed that the somatic musculature is platymyarian in first-stage larvae of forms in which it is later coelomyarian; this was definite evidence that platymyarian musculature is the primitive type. By original definition, the term meromyarian applied to forms in which only 2 muscle cells were present in each muscle sector but the overlapping of muscle cells commonly results in 4 cells in a given sector. The increase in number of muscle cells is gradual, and forms with 5, 6, and even 8 muscle cells in each sector are termed meromyarian. The use of the terms platymyarian and coelomyarian indicates tendencies, rather than exact conditions. These terms may be used to explain a condition in which the muscle fibrils begin to turn up at the edges of the cells and which passes through every stage from the typical platymyarian to the typical coelomyarian condition. Apparently it is a sound hypothesis that forms with platymyarian or meromyarian musculature could have given rise to forms with coelomyarian or polymyarian musculature, while the reverse could not have occurred, and platymyarian forms tending toward coelomyarian or polymyarian musculature are more primitive than forms showing a marked degree of coelomyarity or polymyarity.

Among the parasitic nematodes, we find, in the Strongylata, platymyarian musculature in the Strongyloidea and Trichostrongyloidea and coelomyarian musculature in the Metastrongyloidea. Similarly, in the Ascaridata, the musculature is platymyarian in oxyurids, thelastomatids, kathalaniids and cosmocercids, and is coelomyarian in heterakids and ascarids. Coelomyarian musculature is found in filarioids, spiruroids, and dracunculoids of the Spirurata, as well

as in trichuroids of the Dorylaimata, and dioctophymoids of the Dioctophymata.

Among the free-living nematodes and their relatives, the following observations have been made: In the Enoplata polymyarian musculature has been reported in *Oncholaimus* spp. by various authors, in *Thoracostoma* spp. by Tuerk (1903, Thesis, Leipzig) and by de Man (1904, Result. Voy. d. S. Y. Belgica 55 pp.), and in *Mononchus gerlachei* by de Man (1904). In the Dorylaimata polymyarian musculature has been reported in *Dorylaimus regius* by Chitwood (1932, Zeit. Morph. u. Physiol. 23: 237-284) and in the Mermithoidea by various authors, while meromyarian musculature occurs in *Diphtherophora vanoyei*, according to De Coninck (1931, Bull. Mus. roy. Hist. nat. Belg. 7: 15 pp.). In the Monhysterata polymyarian musculature has been reported in *Siphonolaimus* spp. by zur Strassen (1904, Zool. Jahr. Suppl. 7, Festschr. Weismann: 301-346). In the Rhabditata (synonym Anguillulata) meromyarian musculature has long been given as diagnostic. To the writers' knowledge evidence to this effect, in such definite form as that furnished by sections, has been given only for *Rhabdias* spp. by various authors, and for *Rhabditis* spp. by Chitwood (1930, J. Morph. and Physiol. 49: 251-276). The writers disregard the casual statements of various authors, since it usually requires sections to determine definitely the type of musculature.

In a study of cross sections, the writers have found the following nematodes to be meromyarian or platymyarian: In the Rhabditata, *Rhabditis* spp., *Diplogaster* spp., *Cephalobus elongatus*, and *Strongyloides* spp. of the Rhabditoidea; *Anguillulina dipsaci*, *Aphelenchoides parietinus*, *Aphelenchus avenae* and *Chondronema passali* of the Anguillulinoidea; in the Chromadorata, *Chromadora* sp., *Desmodora* sp., *Plectus parietinus*, *P. granulosus*, *Chronogaster* sp., *Wilsonema* sp. and a member of the Richtersiinae; in the Monhysterata, *Ascolaimus* sp. and *Aphanolaimus* sp.; in the Enoplata, *Tripyla* sp. and *Cryptonchus nudus*. The following were found to be coelomyarian or polymyarian: In the Monhysterata, *Monhystera* sp.; in the Enoplata, *Enchelidium* sp., *Trilobus longus*, and *Ironus* spp.

The number of muscle cells in each sector is usually 2 to 4 in such genera as *Rhabditis*, *Rhabdias* and *Cephalobellus*, as many as 6 in forms such as *Oesophagostomum dentatum*, *Plectus* spp., *Chromadora*, etc., and 8 to 10 in *Dorylaimus*. The transition from platymyarian to coelomyarian musculature has been noted in *Rhabdias* and *Oesophagostomum*. There is a slight indication of this transition in *Plectus*, which becomes distinct in such genera as *Trilobus*, *Oncholaimus*, *Dorylaimus*, *Cucullanus*, *Micropleura* and *Heterakis*, and very marked in *Thoracostomum*, *Monhystera*, *Trichuris*, *Metastrongylus* and *Ascaris*.

Apparently meromyarian or platymyarian musculature occurs in all large groups of free-living, as well as in several groups of parasitic nematodes. Furthermore, it appears that meromyarian musculature occurs in that part of a large group in which the esophagus or the stoma most closely approaches in character these structures as found in *Rhabditis* or *Plectus*, indicating, the authors believe, that nematodes originated as organisms similar to *Rhabditis* and *Plectus* and then diverged, there being a general tendency toward the formation of coelomyarian or polymyarian musculature in the more specialized or "highest evolved" representatives of the various groups. Polymyarity, if this be true, is not necessarily a sign of relationship, but a stage in evolution.

***Capillaria hepatica* from the liver of *Castor canadensis canadensis*.** B. G. Chitwood.

Upon post-mortem examination of a beaver, *Castor canadensis canadensis*, which died at the National Zoological Park, the liver was found to have numerous lesions. These lesions were due to *Capillaria hepatica*. This is apparently the first record of the occurrence of this parasite in the beaver.

A new nematode from birds. E. E. Wehr and B. G. Chitwood.

A new species of nematode belonging to the family Dracunculidae was

found in two birds. This species apparently represents a new genus and for it the name *Avioserpens denticulophasma*, n. g., n. sp., is proposed. For the genus a new subfamily AVIOSERPENSINAE is also proposed. Like the Dracunculinae, the Avioserpensinae differs from the Micropleurinae and Philometrinae in that the esophagus is dilated at the anterior end of the dorsal esophageal gland and the nerve ring is posterior to this dilation, while in the Micropleurinae and Philometrinae no such dilation is present and the nerve ring is further anterior. The new subfamily Avioserpensinae differs from the Dracunculinae in that there is no circumoral elevation in the former group while this is present in the latter group.

Avioserpens, n. g.

Generic diagnosis.—Avioserpensinae: Circumoral elevation absent. Cephalic papillae 14 (internodorsals and internoventrals on mediodorsal and medioventral cuticular elevations; internolaterals close to amphids; dorsodorsals, laterodorsals, lateroventrals and ventroventrals separate). Male unknown. Female with conical tail bent dorsad.

Type species.—*Avioserpens denticulophasma*, n. sp.,

Avioserpens denticulophasma, n. sp.

Description.—*Avioserpens:* Female (fragmentary) total of fragments, including 2 heads and 2 tails, about 590 mm. Diameter 750μ. Oral opening circular, surrounded by delicate membrane with radial fibers. Esophagus consisting of short, narrow anterior muscular part, a relatively large glandular swelling, a constricted part, and a long posterior glandular part indistinctly set off from constricted part. Nerve ring at base of first swelling. Intestine narrow, terminating posteriorly in a closed rectum: anus rudimentary. Tail conical, curved dorsad. Vulva not observed; 2 ovaries, one at each end of body. Viviparous.

Larva (first stage) 400 to 450μ long by 14.3 to 16μ wide. Head bearing small, conical, dorsal cuticular projection. Tail very delicately attenuated, curved ventrad. Phasmids large, postanal; margins denticulated.

Hosts.—A white heron (determination uncertain—*Casmerodius albus egretta* or *Egretta thula thula*) and *Anhinga anhinga*.

Location.—Under mucous membrane of mouth and pharynx.

Distribution.—North America (United States—Louisiana and National Zoological Park, Washington, D. C.)

A new host for the bird dracunculid, *Avioserpens denticulophasma*. E. E. WEHR.

Previously a white heron, *Casmerodius albus egretta* or *Egretta thula thula*, was reported as the original host of *Avioserpens denticulophasma*. Specimens of this same parasite have been identified from the Florida duck, *Anas fulvigula*.

***Rusguniella brevis* Maplestone, 1931, as a synonym of *Aviculariella alcyona* Wehr, 1931.** E. E. WEHR.

A comparison of the description of *Rusguniella brevis*, reported from the gizzard of the kingfisher, *Ceryle alcyon*, in India with that of *Aviculariella alcyona*, also from the gizzard of the kingfisher, *Ceryle alcyon caurina*, in the western part of the United States, shows such close similarity that there can be no doubt that the two species are identical.

The fact that two descriptions of the same nematode under two different names were published in the same month of the same year just a few days

apart is, indeed, a remarkable coincidence. The question of priority of names, therefore, is one to be settled only by determining the day of the month on which the publication of the description of each species was issued. The date of publication of the description of *Aviculariella alcyona* was June 20, while that of *Rusguniella brevis* was June 26. In view of this fact, the specific name *brevis* must be replaced by the specific name *alcyona*. The next consideration is the validity of the genus *Aviculariella* Wehr, 1931.

The genus *Rusguniella* has been characterized as having smooth, non-striated or dentated, crescentric cuticular cordons which are limited to the head region. The vulva is described as opening either just in front of, or just behind, the middle of the body and the vagina is directed anteriorly. There is no mention in the literature of the occurrence of a cephalic vesicle in the genus *Rusguniella* or of the vulva opening at the posterior end of the body near the anus. In the genus *Aviculariella* a distinct cephalic vesicle occurs, the cordons are dentated on their inner margin and triangular in shape, the vulva opens near the anus and the vagina is directed posteriorly for a short distance before turning anteriad. Maplestone did not figure any cephalic vesicle in *R. brevis* but this omission may be attributable to the fact that this structure is very delicate and often collapses when the specimens are placed in preserving fluid.

The present writer believes that the differences which have been pointed out as existing between the genera *Rusguniella* and *Aviculariella* are such as to warrant regarding the latter genus as valid.

Observations on the period required for *Ascaris* eggs to reach infectivity. J. E. Alicata.

The general opinion that so-called "embryonated eggs" of ascarids are regularly infective, is not correct. Ransom and Foster (1920, U. S. Dept. Agric. Bul. 817), noted that embryos of the pig ascarid underwent a molt before hatching, but did not correlate this with infectivity. Eggs of *Ascaris suum* cultured in a 1% aqueous solution of formalin at temperatures of 33°, 30,° and 22° to 24° C., contained molted embryos 16, 18, and 28 days, respectively, after the cultures were started. The results of feeding to young guinea pigs, eggs of *Ascaris suum* containing motile but unmolted embryos were consistently negative; in the lungs of guinea pigs which were fed eggs containing embryos which had already molted, lesions and *Ascaris* larvae were found.

The following ascarid and oxyurid embryos were found by the writer to undergo a molt before hatching: *Ascaris lumbricoides, Ascaridia lineata, Parascaris equorum, Toxocara canis, Toxascaris leonina, Blatticola blattae,* and *Heterakis gallinae.* These findings warrant an extended investigation to ascertain whether a molt before hatching may not be common among the members of the suborder Ascaridata, and may not be a feature which determines the time when the egg reaches the infective stage.

Life history of *Metastrongylus salmi* and remarks on the eggs of the swine lungworms. J. E. Alicata.

It was experimentally determined by the writer, that the larvae of *Metastrongylus salmi,* as already known for other lungworms of swine, *M. elongatus* and *Choerostrongylus pudendotectus,* develop in earthworms to the third or infective stage. The earthworms used in this case were *Lumbricus terrestris* and *Helodrilus caliginosus* var. *trapezoides.*

Eggs of swine lungworms, contrary to reports of some other investigators, usually pass out of the host before they are hatched; the egg shell is thick and roughened, the uneven surface resembling small mammillations. In order to determine the frequency with which lungworm eggs are passed out of the host, egg counts were made from feces passed by a naturally infested, 7-months old pig. The egg count during 10 days varied from 1,200 to 10,000 eggs for each gram of feces, indicating that the number of eggs passed out daily was irregu-

lar. At autopsy, this pig was found to contain a mixed infection with *M. elongatus* and *C. pudendotectus.*

New intermediate hosts for some heteroxenous nematodes. J. E. Alicata.

Based on experimental infestation, the following insects have been found to serve as intermediate hosts for the parasites mentioned below: *Aphodius lividus, Dermestes vulpinus* and *Parcoblatta* sp. for *Gongyloneema pulchrum* (from cattle); *Aphodius granarius* and *Passalus cornutus* for *Ascarops strongylina* (from swine); *Ataenius cognatus* and *Passalus cornutus* for *Physocephalus sexalatus* (from swine).

***Trichostrongylus longispicularis* collected from cattle in the United States.** John S. Andrews.

Fig. 5. Spicules and gubernaculum of *Trichostrongylus longispicularis.*

Gordon (1933, Austral. Vet. J. 9:35-36) described a new species of *Trichostrongylus* from the intestine of a sheep in Australia, which he named *Trichostrongylus longispicularis.* This nematode differs from the other species of the genus *Trichostrongylus,* commonly reported from sheep, in the size and conformation of the spicules and in the termination of the dorsal ray. In 1932 and 1933 there were collected from the fourth stomachs of cattle at Jeanerette, Louisiana, 3 male specimens of a trichostrongyle which apparently differed from other trichostrongyles hitherto reported from cattle. These nematodes belong in the genus *Trichostrongylus* and a comparison of the available specimens with the published description of *Trichostrongylus longispicularis* shows that there is a great similarity between these nematodes collected from cattle at Jeanerette, Louisiana, and males of *T. longispicularis* collected from sheep in Australia, as may be seen from the following comparative table of dimensions:

	T. longispicularis	Specimens from cattle	
Length	5.5 mm.		5.6 mm.
Width of head	14μ		10μ
Width of body immediately anterior to bursa	113.6μ		98μ
Length of spicules	184.6μ	Right	175-180μ
		Left	190μ
Length of hook-like projections			40-50μ
Length of gubernaculum	85.2μ		90μ

The females of this species are unknown.

An experimental infestation of *Nippostrongylus muris* in mice. Dale A. Porter.

Although considerable work has been done upon *Nippostrongylus muris* in rats no report of this form occurring in mice has come to my attention. Accordingly 12 white mice were infected by skin with the larvae of this form and their feces examined daily by Lane D.C.F. until autopsy 11 days after infesting them.

Of 6 mice, 6 months old, given 300 larvae each, 2 passed embryonated ova 9 days after infection and at autopsy were found to harbor 88 and 23 adult worms respectively. Of the 4 that did not pass ova before autopsy 3 were free from worms and one had 5 immature forms. There was then an average of 19.3 worms or 6 percent development in this older group of mice. Examination of the lungs in this group showed an average of 77.6 larvae, the majority of which were still alive.

Due perhaps to a greater susceptibility of younger animals that is generally observed in host-parasite relationships, a different picture is obtained when mice 20 days old are infected with the same number of larvae. Four mice of this age passed eggs 7 days after parasitizing and at autopsy yielded 219, 228, 199, and 133 worms respectively. In the same order 3, none, 4, and 7 larvae were recovered from the lungs. There was then an average of 194.7 worms (64.6 percent development) in the intestines and an average of only 6 larvae in the lungs.

One mouse 20 days old, given 1,000 larvae, passed ova 9 days later and harbored 951 worms (95.1 percent development) in the intestine and 11 larvae in the lungs at autopsy 11 days after infection. However, a mouse 6 months old, given the same number of larvae, did not pass any eggs and at autopsy, 11 days after infection, was found to have 380 immature specimens in the intestine (38 percent development) and 177 larvae in the lungs.

The percentage development in the young mice in this one experiment compares favorably, in my experience, with the development of this form in black-hooded rats of a comparable age. Additional experiments are in progress to test further the various relationships of this form to the mouse and complete data will be reported later.

The effect of "burning over" land on the viability of the larvae of *Stephanurus dentatus*. L. A. Spindler.

In a previous report, the writer (1933, N. Amer. Vet. 14:37-44) discussed the results of tests designed to determine whether burning the dead grass and accumulated debris on land infested with swine nodular worm larvae could be used as a control measure against this parasite. During the course of these tests, examinations were made to determine whether the kidney worm larvae, which also infested these "burned over" areas, were killed. In making these determinations soil was collected from the infested areas within one-half hour after the grass and debris had been burned. A few hours later this soil was examined by means of the Baermann apparatus for the presence of live kidney worm larvae. Examinations were made of soil from two pastures on which the vegetation was burned in September, 1930, of two pastures on which the vegetation was burned in February, 1931, and of two feeding grounds on which the accumulated corn husks were burned both in September, 1930, and in February, 1931. As stated previously, the soil, in each case, was examined within a few hours after collection. In each examination live, active, kidney worm larvae were recovered from the soil of the "burned over" areas. This indicates that burning the vegetation and debris on areas infested with kidney worm larvae did not free the soil of all the larvae present.

Notes on the life history of *Cheilospirura hamulosa*, the chicken gizzard worm. Eugenia Cuvillier.

Complete experimental evidence is now available that the grasshopper *Paroxya clavuliger* may serve as an intermediate host for the gizzard worm, *Cheilospirura hamulosa*. Experimentally developed larvae from grasshoppers of this species were fed to a turkey and four chickens. On post-mortem examination, the turkey, fed 18 larvae, contained 4 worms; the chickens showed no evidence of infection in one, typical gizzard lesions but absence of worms in two, and 16 worms in the fourth, this last mentioned chicken having received 30 larvae and the others from 10 to 40 larvae each. Last year, feeding similarly developed larvae to chickens gave negative results (1933, J. Parasitol. 19: 244-245).

The infected chicken was killed 52 days after infection. Contrary to previous observations at this period of the life history, the immature worms were found in the musculi intermedii, the position normal for adult worms, just beneath the corneous lining or in the muscular coat of the gizzard, very close to

the inner surface. The worms varied considerably in size, ranging from 3.25 to 11.0 mm. in length.

Observations on nematodes parasitic in tubers of the cinnamon-vine (*Dioscorea batatas*). G. STEINER.

Tubers of *Dioscorea batatas* Decne. from Japan, intercepted at the port of Philadelphia and submitted to us for nematode examination by N. R. Hunt of the U. S. Bureau of Plant Quarantine, were found to be infested by a new species of *Paraphelenchus*, here called *P. amblyurus*, n. sp. The infestation was restricted to subcortical portions of the tubers, the affected tissues being brownish in color and the surface at these places being blackish and rugose. Specimens, however, were found not only in the discolored tissues but also in adjoining portions which still appeared healthy. Since the tubers were dry, all nemas observed, including adults and larvae, were motionless, some being dead, but a large number being merely dormant and reviving after soaking.

A few other species were associated with the above-mentioned, but only in small numbers and none revived. Among these were some specimens of *Aphelenchoides fragariae* (Ritzema Bos) and *A.* (*Seinura*) *tenuicaudatus* (de-Man). For both species Japan is a new locality and *Dioscorea batatas* a new host. An *A. fragariae* female measured as follows:

1.7	5.8	11.	47.—69.	95.	0.6 mm
1.4	1.9	1.9	2.4	1.1	

Besides these, two badly shrunken specimens of what appeared to be *Diplogaster longicauda* Claus and a single *Rhabditis* sp. were observed.

Paraphelenchus amblyurus, n. sp. (Fig. 6)

This new *Paraphelenchus* is a very characteristic species easily recognized by its tail in both sexes and the larval stages. In the female and the various larval stages this tail may have the shapes as shown in figure 6, E and G (left and center). The obtuse terminus has on the ventral and often also on the dorsal curve a short mucronate process. The female tail is slightly longer than the rectum or about 2½ times the anal body diameter. The male tail is shorter, more conical, and about 1½ times the anal body diameter.

In general, the body is cylindrical in shape, tapering only at the very anterior end. The annulation of the cuticle is quite plain; in the region of the esophageal bulb there are about 6 annules to 5μ. A lateral field, about 6μ wide, is bordered by wings and bears 4 longitudinal striae. The head is broadly rounded, lips are not differentiated, and the arrangement of the sense organs seems essentially the same as in *Aphelenchoides*.

The buccal stylet has no basal knobs, but is otherwise strong and has well developed protrudor muscles. Some specimens were seen in which, through slight breaks in the stylet walls, the elements of the rhabditid or cephalobid buccal cavity still seemed to be marked, and which are interpreted in figure 6, F. A remarkable feature was observed in the middle bulb of the esophagus in that its anterior portion is set off from the posterior one by a slight constriction, and is in addition histologically different. At the juncture of the two portions of the bulb the cuticularized lining of the esophageal canal is also broken. The lining consists of short rod-like pieces reaching posteriad to the valves of the bulb. These are formed by strongly curved cuticular pieces, which if seen from the edge are slightly bifurcated, at least posteriorly and perhaps also anteriorly (Fig. 6, A, D). The terminal esophageal bulb is cone-shaped and well set off from the intestine but not from the isthmus, from which it develops by gradual increase. It seems to lack all fibrous tissue. Only with difficulty were the nuclei of the esophageal glands located (Fig. 6, A). Their outlets are

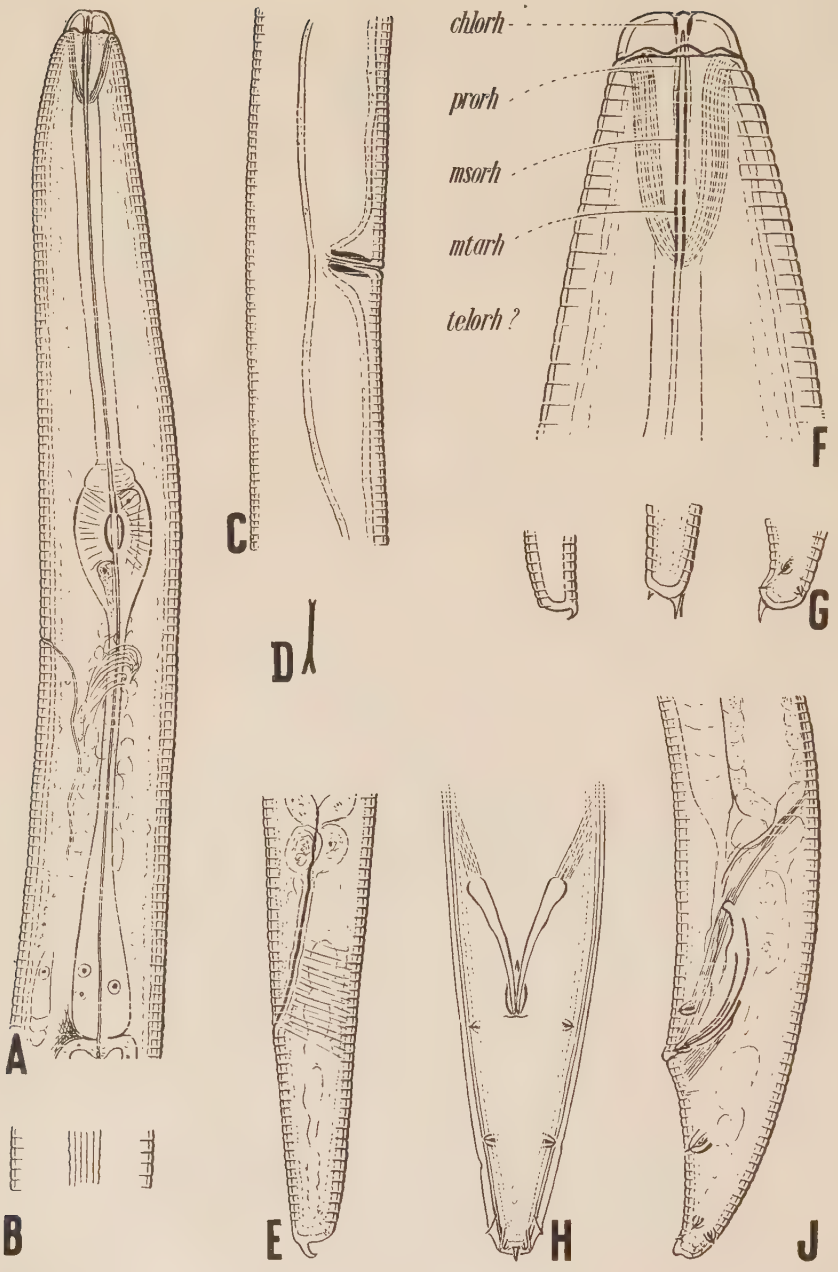

Fig. 6. *Paraphelenchus amblyurus*, n. sp.

A—Esophageal region of female. B—Lateral field showing wings and longitudinal striae. C—Vulvar region of female. D—Valve of median bulb seen from edge. E—Female tail. F—Head of male: *chlorh*, cheilorhabdion; *prorh*, prorhabdion; *msorh*, mesorhabdion; *mtarh*, metarhabdion; *telorh?* telorhabdion apparently absent. G—Types of mucrones, left and center being females, right being male. H—Ventral view of male tail. J—Lateral view of male tail. All figures are X 800 except F, which is X 2,100.

in the middle bulb and have therefore the same arrangement as in members of *Aphelenchoides* and *Aphelenchus*. In revived specimens the ampulla formed by these glandular outlets usually exhibits a concretion which, with the surrounding clear space, simulates a nucleus.

Anteriorly the circumference of the intestinal tube is made up of two large, flat cells in such manner that each previous pair alternates in position with the succeeding one. Toward the posterior end, however, the cells seem to decrease in size but increase in number. The usual three rectal glands are present. The rectum is exceptionally long, being over twice the anal body diameter in the female and almost twice in the male. The dilator muscle of the anus in the female is also remarkable, reaching almost halfway up the rectum.

The excretory pore opens ventrad of the nerve ring; the renette or ventral gland seems to consist of one large and two minute cells located ventrad of the esophageal bulb (fig. 6, A).

Female sexual apparatus prodelphic, not reflexed, with posterior uterine branch; vaginal wall with cuticular reenforcing pieces.

Testis not reflexed; spicula arcuate, quite slender, indistinctly cephalated proximally, with characteristic ventrad protruberance at about the first third of their length. Gubernaculum a little over 1/3 spicula length, in side view lineate with small posterior apophysis, in ventral view enveloping the spicula laterally and distally. Arrangement of copulatory papillae as in figure 6, H, J. Preanal ventrosubmedial papillae mostly absent; papillae on level with anal opening changing somewhat in position forward and backward; other papillae fairly constant. Terminus of tail more or less obtuse or with short mucro.

Measurements:

Female:

1.9	13.	22.	[41]76.	93.6	0.69 mm
1.8	3.5	4.	4.	2.2	

Male:

1.7	15.	25.	[65]M	95.5	0.68 mm
1.7	3.2	3.4	3.6	2.5	

Diagnosis.—Paraphelenchus with slightly tapering, somewhat elongate female tail ending in truncate terminus with one to three mucrones; male tail slightly shorter, more conical, more or less obtuse, with or without single mucro, and with copulatory papillae as follows: on each side ventrosubmedially a papilla about level with anal opening, rarely a similar papilla anteriorly at about the middle of the spicula, then also ventrosubmedially a papilla in the middle of the tail, another at the beginning of the last fifth of the tail, and one slightly ventrosubmedial and one or two dorsosubmedial closer to the terminus.

Type host.—Dioscorea batatas.

Type locality.—Japan.

A new variety of the bulb or stem nematode, *Anguillulina dipsaci*, and other variations in this species. G. Steiner.

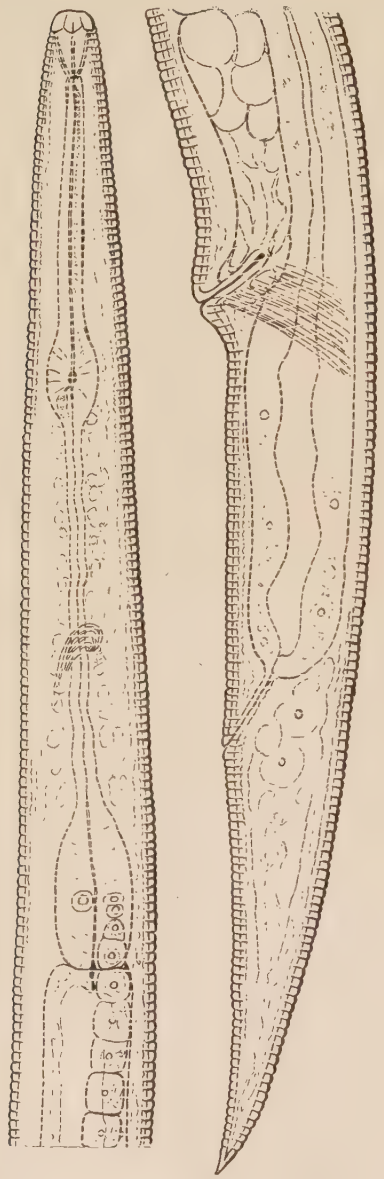

Fig. 7. *Anguillulina dipsaci* var. *allocotus*, n. var. Anterior and posterior parts of female. About X 770.

In a collection of nemas made by G. Thorne from sod in the governmental farm at Arlington, Virginia, there was observed a specimen of what appears to be a new variety of *Anguillulina dipsaci* (Kühn, 1857) Goodey. Through the courtesy of the collector we were able to make a detailed study of this specimen. The matter is of interest because of recent discussions concerning variation in this species, especially in regard to host specificity. Unfortunately the host plant is not known in this case. The nema, however, shows morphological differences which seem not to be purely teratological.

Anguillulina dipsaci var. *allocotus*, n. var.
(Fig. 7)

The specimen is a female, closely resembling the type except for the following diagnostic differences: Vulva more posteriad than type (see measurements) and very prominent because of an abrupt narrowing of body posterior to it. Posterior uterine branch absent. Distance vulva to anus about same as tail length.

Measurements:

		n. r.				
1.3	?	7.8	13.	^{53}.—87.	93.	1.16 mm
1.1	?	1.5	2.1	2.6	1.2	

H. J. Reynolds, State Nursery Inspector at Sumner, Washington, recently submitted a single specimen also of *Anguillulina dipsaci*, which was found among typical individuals in a heavily infested narcissus leaf (var. King Alfred). The anterior end of this specimen exhibited a most remarkable tapering toward the head, which may best be expressed by the following formula:

Female:

		med.					
		blb.	n. r.				
0.82	5.9	6.7	(?)	^{75}.—82.	$^{8.0}$	94.6	1.5 mm
0.77	1.4	1.5	(?)	2.6		1.3	

Our records show, however, that similar specimens with this pronounced anterior tapering, especially males, were observed in a population of this same nematode in *Colchicum speciosum*. Here this pronounced tapering seemed to be rather the normal since 11 females and 11 males averaged the following measurements:

Female:

		n. r.				
0.9	(?)	7.5	13.0	$^{66.7}$—81.	$^{8.1}$ 93.5	1.03 mm
0.9	(?)	1.6	1.8	2.3	1.5	

Male:

0.9	(?)	7.5	13.2	M	93.4	1.02 mm
0.8	(?)	1.4	1.6	2.08	1.4	

The width at the base of the spear varied between 0.7 and 1.2 percent of the total body length.

The classification of the higher groups of dorylaims. GERALD THORNE.

A study of about 200 species of dorylaims, representing 22 genera, has revealed that this group is a superfamily for which the name Dorylaimoidea is proposed. This superfamily includes Dorylaimidae deMan, 1876, emended, and Alaimidae Micoletzky, 1922, emended.

Many groups previously assigned to these families must be placed elsewhere. The 18 described genera retained are listed below with the emended diagnoses. Four new genera which have been studied are not included.

Superfamily DORYLAIMOIDEA, new superfamily

Diagnosis.—Free-living nemas inhabiting fresh-water and non-brackish soils, rarely marine. Length seldom over 10 mm. Pharynx, if armed, then with an axial spear or a mural tooth. Aperture of axial spear located dorsally. Esophagus consisting of a slender anterior portion without valvular bulbs, followed by an expanded portion that may be reduced to a simple, valveless bulb. Amphids stirrup-shaped, pouch-like, with slit-like or ellipsoidal apertures. Cephalic papillae arranged in two circlets, six in the inner and ten in the outer circlet. Lateral series of pores present. Prerectum usually, perhaps always, present. Differentiated lateral wings absent; if any wings present then of equal size distributed over entire circumference. No setae or spinneret. Excretory pore generally absent or rudimentary.

Type family.—Dorylaimidae deMan, 1880.

DORYLAIMIDAE deMan, 1876, emended

Diagnosis.—Dorylaimoidea: Pharynx armed with an axial spear or mural tooth. Remaining characters identical with those of the superfamily.

Type genus.—Dorylaimus Dujardin, 1845.

Other genera included in Dorylaimidae: *Actinolaimus, Antholaimus, Axonchium, Chrysonema, Campydora, Discolaimus, Doryllium, Dorylaimellus, Leptonchus, Longidorus, Nygolaimus, Oionchus* (?), *Sectonema, Tylencholaimus, Tylencholaimellus* and *Xiphinema.*

ALAIMIDAE Micoletzky, 1922, emended

Diagnosis.—Dorylaimoidea: Pharynx narrow, tubular, unarmed. Remaining characters identical with those of the superfamily.

Type genus.—Alaimus deMan, 1880.

Only one other genus, *Bolbinium,* included in this family.

Survival and revival of *Anguillulina dipsaci* from narcissus material. GRACE W. SHERMAN.

From numerous preliminary tests and experiments carried on in an effort to discover satisfactory eradication measures for this plant parasite, several observations seem important.

1. It is the preadult larval stage that survives desiccation, becomes dry and dormant and, in both the hot water and vapor heat treatments, resists higher temperatures for longer periods than do the active specimens. A series of hot water and vapor heat treatments was carried on at Babylon, Long Island, in September of this year, in collaboration with Mr. F. J. Spruijt and Mr. F. S. Blanton of the Bureau of Entomology. Live *Anguillulina dipsaci* were found in bulbs hot-water-treated at 115° F. for 5 hours, and at 118° F. for 2 hours, in bulbs vapor-heat-treated for 116° F. for 6 hours and in dried leaves vapor-heat-treated at 120° F. for 3 hours. Every case of survival proved to be the preadult stage.

2. The resistance to these treatments, and therefore the survival of *A. dipsaci,* is greater in older and drier material. The difference between dried and fresh narcissus material was brought out in a test in which 150 active specimens were taken from fresh green leaves and 150 from dried leaves. Both lots of nematodes were picked into water and treated at 111.2° F. for 3 hours. The next day all except one specimen from the dried material had revived, whereas only 26 out of 150 (or 17.3 percent) from the fresh material had revived. All the specimens from the dried leaves were preadults, whereas the green leaves contained males and females.

3. The fact that these nematodes are not active, or will not respond to stimuli immediately or in 15 or 20 minutes, or even several hours, after soaking or treatment, does not prove that they are dead or have been killed, since they may revive later—the next day or as long as a week thereafter. In general, the longer they have been dried, the longer it takes them to revive, but the condition under which they were dried is also an important factor. Dormant *A. dipsaci* from a very dry narcissus bulb continued to revive up to the eighth day of soaking in tap water. (This bulb had been in cold storage at about 40° F. for about 11 months, then out of cold storage at room and air temperature for about 4 months.)

4. The preadult form which is not killed by desiccation will stand repeated dryings. In one test where 500 of these dormant nemas were soaked, 31 had revived the next day in tap water. These 31 specimens were allowed to dry again in the watch glass for several days and were then soaked a second time. Fifteen, or approximately one-half of them, revived in tap water in about 2 hours. Other preadults were dried and revived daily for a week, then dried for several days and revived again.

Experiments have been made, and more are to be made along the line of soaking and treating narcissus material previous to the hot water and vapor heat treatments in an effort to lessen the resistance, and thereby the survival of this dormant stage. The heat treatments are more effective if these dormant nemas are first revived. It is hoped that these measures, when further developed, may solve the problem of eradication, or at least the control, of this persistent bulb parasite.

Some experiments concerning the revival of quiescent *Anguillulina dipsaci*.
Wilber D. Courtney and Randall Latta.

One of the main reasons for failure of the hot water treatment of narcissus and other bulbs for the control of the bulb or stem nema, *Anguillulina dipsaci,* is the presence of quiescent or dormant specimens of the latter. Neither the regular hot water treatment nor the vapor heat treatment, as recently developed, is a hundred percent lethal to these quiescent specimens. Tests were therefore made to develop a method for reviving such quiescent *Anguillulina* previous to the regular treatment. As a result of such preliminary tests, the following deductions are presented:

1. Activity is induced at temperatures of from 70° to 80° F. through the application of either vapor heat or hot water.
2. Temperatures of 60° and 90° F. have little effect on activity.
3. Temperatures below 60° or above 100° F. induce inactivity.
4. Reviving the quiescent state of *Anguillulina dipsaci* depends considerably upon the type of infestation and the condition of the host bulb.

The identity and origin of the sucking lice of American monkeys. HENRY E. EWING.

The identity of the sucking lice found on American monkeys has been a subject of controversy, some workers holding that they are the same as those occurring on man and others that they are different. A few years ago the opinion was expressed by the writer that all of the lice taken from American monkeys were distinct from any form occurring on man. When this opinion was given it was easily demonstrated that all of the forms represented in our National Museum collection were very distinct in certain characters from the varieties of *Pediculus* occurring on man. So distinct were they in fact, that a new subgenus, *Parapediculus*, was erected for their reception. However, since then material has been received of a different sort. On August 29, 1930, a monkey, *Pithecia monachus*, from the Upper Amazon, died at the National Zoological Park. This individual was heavily infested with various stages of a *Pediculus* species. A few days later, September 10, 1930, a second monkey, *Cacajao rubicundus*, from the Upper Amazon, died at the National Zoological Park. It also was heavily infested with the same species of *Pediculus*, and I collected many specimens representing various stages of development.

A careful study of the specimens obtained from these two monkeys indicates that they represent *Pediculus humanus americanus* Ewing. Particularly convincing in this respect is the direct comparison of the tritonymph of the monkey-infesting species with a tritonymph from the scalp of a pre-Columbian American Indian mummy. Admitting for the sake of argument that these monkey-infesting lice are the same as those on American Indians, two questions arise. Did these individual monkeys get their lice from infested humans, or was this louse species acquired many generations ago by some common ancestor of the two monkey species? To me it appears that these lice very probably were acquired directly by one of these two monkeys from some human and then spread to the other monkey. And if living American monkeys can be successfully parasitized by a human variety of *Pediculus humanus*, we have here an indication that other forms of *Pediculus* found on some of these monkeys may be only the descendants from lice that were acquired many generations ago by monkeys from the first American Indians to reach tropical America.

***Haemaphysalis cinnabarina* Koch, 1844, from the sharp-tailed grouse.** ALLEN MCINTOSH.

Ticks collected by Dr. G. W. Cronen from the sharp-tailed grouse, *Pedioecetes phasianellus* (Linnaeus), south of Eagle Butte, South Dakota, have been identified as *Haemaphysalis cinnabarina* (= *H. chordeilis*). This is a new host record and a new locality record for this tick. Dr. Cronen stated in correspondence that 8 birds taken September 23, 1933, had several engorged ticks attached to the head and a large number of small ticks crawling among the feathers. Four additional birds of this species taken September 25, 1933, were also infested with the same species of tick.

Ticks from Australia. ALLEN MCINTOSH.

A collection of Australian parasites recently donated to the U. S. National Museum, a part of the collection of the late Doctor N. A. Cobb, contained sev-

eral unidentified ticks which have since been catalogued and identified as follows: *Amblyomma limbatum* Neumann, 1899, 1 male, from "large lizard"; *Aponomma decorosum* (L. Koch), several males and females, from *Varanus* sp. and "large lizard"; *Ixodes fecialis* Warburton and Nuttall, 1909, 7 males and 16 nymphs, from *Dasyurus viverrinus* (Shaw); *Ixodes holocyclus* Neumann, 1899, 1 female; *Ixodes ornithorhynchi* Lucas, 1845, 1 female and 3 nymphs, from *Platypus;* and *Ixodes tasmani* Neumann, 1899, 1 male, from *Dasyurus viverrinus*, 3 females, from "common opossum" and "opossum," and 13 nymphs, from "common opossum," "ring tailed opossum," "opossum," "native-cat" and *Dasyurus viverrinus.*

Distribution of *Boophilus annulatus australis* (Fuller) in the United States. ALLEN MCINTOSH.

In order to determine the distribution of *Boophilus annulatus australis* in the United States, the Tick Eradication Division of the Federal Bureau of Animal Industry, placed at the writer's disposal more than 700 lots of ticks, comprising as a rule, several ticks per lot. These ticks were collected during the period 1931-1933, from Florida, Louisiana and Texas. An examination of the male ticks of the genus *Boophilus* revealed the variety *australis* as present in the following counties in Florida: Putnam, Volusia, Lake, Citrus, Sumter, Orange, Seminole, Brevard, Indian River, Oceola, Polk, Hernando, Pasco, Hillsboro, Pinellas, Highlands, Okeechobee, St. Lucie, Glades, Charlotte, Lee, Hendry and Collier; no ticks were received from Desoto, Hardee, Manatee or Sarasota counties which are also in the area quarantined for tick fever. All male ticks of this genus received from Florida had the tail-like spine described for the variety *australis.* This variety was received also from Cameron, Willacy and Brazoria counties in Texas. The males of the genus *Boophilus* from several other counties in Texas and all the specimens received from Louisiana (mostly from the parishes in the south-eastern part of the state) were *B. annulatus* (Say). The hosts for the variety *australis* from Florida were cattle, horses, deer, goats and dogs; from Texas, cattle and horses. Ticks from deer in Webb County, Texas, including males, were identified as *B. annulatus*, not *B. annulatus australis.*

Localization of *Trichomonas columbae* in the domestic pigeon, ring dove and mourning dove. GEO. E. CAUTHEN.

Review of the literature—Rivolta (1880, La Med. d. uccelli etc. Pisa, p. 173), Jewett (1907, J. Comp. Path. and Ther. 20: 122-125), Ratz (1913, Ztschr. Bakt. Parasit. u. Infektionskr. 71: 184-189), Waterman (1918, Tijdschr. Vergelijk. Geneesk. 4: 40-47) and Oguma (1931, J. Faculty Sc. Hokkaido Imp. Univ. s. 6, 1: 117-131)—shows that *Trichomonas columbae* of the domestic pigeon has been recorded from the small intestine, liver, pancreas and mouth mucous (Mundschleim).

Although Ratz (1913) records having seen *Trichomonas columbae* in the mouth mucous, I believe the following report of its occurrence in the upper digestive tract as well as in some of the other organs is worth recording. This organism was found in the crop contents of practically all birds in a large colony of common pigeons (*Columba livia*), ring doves (*Streptopelia risoria*) and mourning doves (*Zenaidura carolinensis*) on Long Island, in a pigeon colony in Baltimore and sick pigeons sent to the laboratory from New Jersey.

In the colony on Long Island, which the author had under observation during the past two years, the flagellates were found associated with inflammatory changes which eventuate in yellowish caseous deposits, and, in some instances, occluded to the point of apparent obliteration the affected pregastric intestine. Focal areas of necrosis were also present in the liver, lung, pancreas, and heart.

Balantidium of chimpanzee in white rat. F. O. ATCHLEY.

During the past 6 months, 120 laboratory rats have been intracecally inoculated, in consecutive groups of 3, at intervals of 4 to 6 days, with trophozoites of balantidia of the chimpanzee, according to the technique of Andrews (1930, Trans. 8th Cong. Far East Assoc. Trop. Med. p. 194). Subsequent examinations have revealed the infection to be consistently established and in one instance it has endured for at least 5 months. No less than 70 percent of the total number of animals were positive 4 days to 5 months after inoculation. This is a confirmation of the work of Andrews (1930) and that of Nelson (1933, Doctor's thesis, Johns Hopkins Univ.). A diet consisting of 85 percent carbohydrates was used.

MINUTES

One hundred fifty-seventh to the one hundred sixtieth meetings

The 157th meeting was held October 21, 1933. Officers were elected as follows:

President, Myrna F. Jones; Recording Secretary, L. A. Spindler; Corresponding Secretary-Treasurer, E. E. Wehr.

Papers were presented by Messrs. Alicata, Chitwood, Courtney, Randall, Fallis, Hall, McIntosh and Wehr (see this issue).

The 158th meeting was held November 18, 1933. The following resolution was presented by Dr. Hall and adopted by the Society:

The Helminthological Society of Washington learns with great regret of the death of Dr. Friedrich Fuelleborn of the Institut für Schiffs und Tropenkrankheiten, a distinguished foreign corresponding member of the Society. With his passing there comes to an end a series of splendid studies in the field of parasitology by a man who was in all his work careful and competent. Many of us have lost a personal friend by the death of this friendly and likeable man. We recall with pleasure his lecture before the Society on the occasion of his election to foreign membership to fill the place vacated by the death of his distinguished countryman, Dr. Looss. To his family and associates we extend our sincere sympathy for their loss. A good man has gone from us, but as we recall his death with regret we shall recall his life with pleasure.

Papers were presented by Miss Sherman, and by Messrs. Atchley, Cauthen, Cross, McCoy, Mueller, Porter, Thorne, and Wright and Bozicevich (see this issue).

The 159th meeting was held December 16, 1933. At this meeting the Society voted to assume independent publication of its Proceedings. Papers were read by Messrs. Alicata, Ewing and Wehr (see this issue).

The 160th meeting was held January 20, 1934. The following resolution was presented by Dr. Steiner and adopted by the Society:

The Helminthological Society of Washington learns with deep regret of the death of its honorary member, Dr. Constantin Janicki,

professor of Zoology at the University of Warsaw, Poland. Born in 1876 in Moscow of a Polish father and an Italian mother, Janicki received his early education in Warsaw, then entered the University of Leipzig where Leuckart introduced him into the field of parasitology. He subsequently worked in Weismann's laboratory in Freiburg, Germany, and with Zschokke in Basel, Switzerland, where he acquired his doctorate, became Assistant and Privatodozent. Italy, his mother's native country, became his second homeland, and always attracted him. In the laboratory of Grassi in Rome he began those unsurpassed studies of parasitic Protozoa in which he won great fame. Later he returned to Switzerland to begin the study of the life cycle of *Diphyllobothrium latum* at the University of Lausanne. At the close of the War the University of Warsaw called him to take the chair of zoology, which he held until his death in October, 1932. His most outstanding accomplishments are the morphological studies in parasitic Protozoa mentioned above, the discovery, together with Rosen, of the life cycle of *Diphyllobothrium latum,* and later, while in Warsaw, investigations into the development of *Amphilina.* Janicki was a man of unassuming, very charming and friendly personality, and a research worker of the highest quality. His name will always stand out in the history of parasitology.

Papers were read by Messrs. Alicata, McIntosh, Price and Spindler (see this issue).

L. A. Spindler, *Secretary.*